

ABSTRACT FINAL ID: P31F-07;

TITLE: Laboratory Studies of Fischer-Tropsch-Type Reactions and their Implications for Organics in Asteroids and Comets (*Invited*)

SESSION TYPE: Oral

SESSION TITLE: P31F. Exploration of Planetary and Stellar Bodies: Experimental and Seismic Approaches I

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ABSTRACT BODY: We have been studying Fischer-Tropsch type (FTT) reactions as a source for organic materials both in the gas phase of the solar nebula and incorporated into primitive comets and asteroids for almost 10 years, and over this time our concept has evolved greatly from the standard “catalytic” model to a much more robust chemical scenario. Our simulations have been conducted at temperatures that are much higher than we like, primarily for practical reasons such as the timescale of individual reactions, and we are just starting a series of measurements to allow us to measure reaction rates at temperatures from 873K down to as low as 373K. We have preliminary data on the carbon ($\delta^{13}\text{C} = -50$) & nitrogen ($\delta^{15}\text{N} = +9.5$) isotopic fractionation at 873K, but not on materials produced at lower temperature. Isotope values are on the VPDB scale for carbon and vs. Air for nitrogen. We have also investigated the noble gas trapping efficiency of the FTT process by adding a small amount of a noble gas mix to our standard synthesis mix. The noble gas ratio is 49:49:1:1::Ne:Ar:Kr:Xe. Xe and Kr are trapped at 873K and are more efficiently trapped at 673K with no isotopic fractionation at either temperature. Ar trapping is detected at 673K, but not at 873K. Ne has not yet been observed in our samples.

The solar nebula was an extremely complex system, mixing materials from the innermost regions out to well into the zones where comets formed and thus mixing highly processed nebular materials with grains and coatings formed before the nebula began to collapse. Laboratory studies may provide the means to separate such diverse components based on carbon or nitrogen isotopic fractionation or the quantities of noble gases trapped in grain coatings and their thermal release patterns, among other observables. The ultimate goal of laboratory synthesis of nebular analogs is to provide the means to identify the conditions under which natural samples were formed and the signatures of subsequent metamorphic events.

KEYWORDS: [6000] PLANETARY SCIENCES: COMETS AND SMALL BODIES, [6040] PLANETARY SCIENCES: COMETS AND SMALL BODIES / Origin and evolution, [6015] PLANETARY SCIENCES: COMETS AND SMALL BODIES / Dust, [6205] PLANETARY SCIENCES: SOLAR SYSTEM OBJECTS / Asteroids.

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